



EUROPEAN ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEM (EARSS)



Quarter 4, 2002

March, 2003

Quarter 4 2002 Key points

- *S. aureus*: MRSA rate 41.7% (Q3, 40.6%)
- *S. pneumoniae*: PNSP rate 13.9% (Q3, 12.5%)
- *E. coli*: 4.6% were resistant to 3GCs (Q3, 1.6%); 8.9% resistant to ciprofloxacin (Q3, 3.2%); 5.1% resistant to gentamicin (Q3, 0.5%)
4 isolates with multiple-resistance to ampicillin, 3rd-generation cephalosporins (2 ESBL-positive), ciprofloxacin and gentamicin
- Enterococci: VRE rates - *E. faecalis*, 0% (Q3, 7.3%); *E. faecium*, 7.7% (Q3, 6.3%)

Quarter 4 analysis

In Quarter 4 (Q4) 2002, twenty-three laboratories participated in the *Staphylococcus aureus* and *Streptococcus pneumoniae* arms of the study, while twenty-one participated in the *Escherichia coli* and *Enterococcus faecalis/E. faecium* components. The full list of laboratories currently participating in EARSS in Ireland is printed at the end of this newsletter.

Staphylococcus aureus

Routine susceptibility test results are submitted on the first invasive isolate (blood only) per patient per quarter. Susceptibility data are required for methicillin or oxacillin. All methicillin-resistant *S. aureus* (MRSA) isolates are referred to the National MRSA Reference Laboratory (NMRSARL) at St. James's Hospital, where minimum inhibitory concentration (MICs) to oxacillin and vancomycin are performed.

Data from Participating Laboratories

A total of 276 episodes of *S. aureus* bacteraemia were reported in Q4 2002. Isolates from 115 patients (41.7%) with *S. aureus* bacteraemia were resistant to methicillin. Susceptibility data to the most important anti-staphylococcal antibiotics for all *S. aureus*, methicillin-resistant and methicillin-susceptible *S. aureus* (MRSA and MSSA) isolates are shown in Figures 1-3. Three laboratories reported zero episodes of *S. aureus* bacteraemia during the quarter.

In comparison, there were 215 isolates in Q4 2001 yielding 36.3% MRSA. The MRSA rate for the year 2001 was 42.0%.

Data from National MRSA Reference Laboratory

Of the above 115 MRSA isolates, 101 were referred to the NMRSARL for further evaluation, along with five additional isolates (e.g. MRSA isolated subsequent to MSSA or second strains of MRSA with a different antibiogram from the same specimen/patient). No data were available on 14 isolates reported to EARSS at NDSC. Antibiogram results are shown in Figure 4.

MIC results (determined by Etest) were available on 106 isolates. The majority (63%, n=67) exhibited oxacillin MIC values of >256 mg/L. All isolates exhibited vancomycin MIC values of ≤4mg/L.

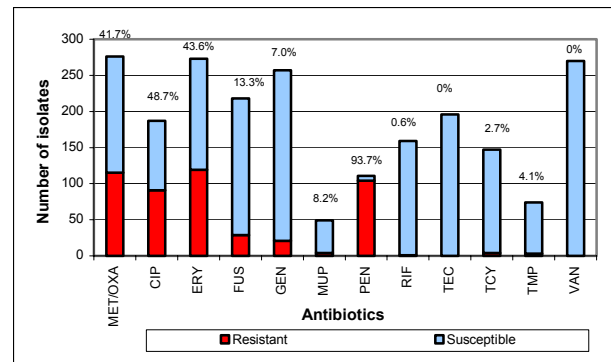


Figure 1. Susceptibility data for all invasive isolates of *S. aureus* (MRSA and MSSA) reported in Q4 2002. Percentage resistance is indicated above the bar.

Antibiotic codes: MET, methicillin; OXA, oxacillin; CIP, ciprofloxacin; ERY, erythromycin; FUS, fusidic acid; GEN, gentamicin; MUP, mupirocin; PEN, penicillin; RIF, rifampicin; TEC, teicoplanin; TCY, tetracycline; TMP, trimethoprim; VAN, vancomycin.

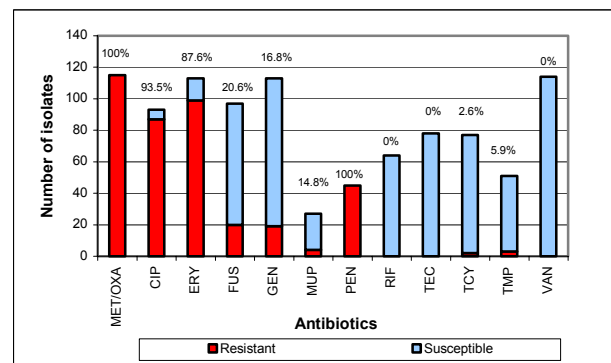


Figure 2. Susceptibility data for invasive isolates of MRSA reported in Q4 2002. Percentage resistance is indicated above the bar. See legend for Figure 1 for explanation of antibiotic codes.

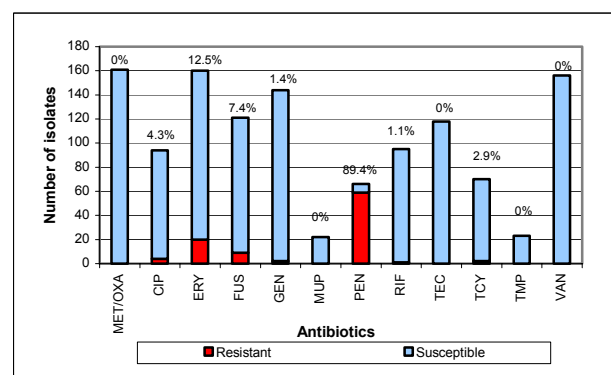


Figure 3. Susceptibility data for invasive isolates of MSSA reported in Q4 2002. Percentage resistance is indicated above the bar. See legend for Figure 1 for explanation of antibiotic codes.

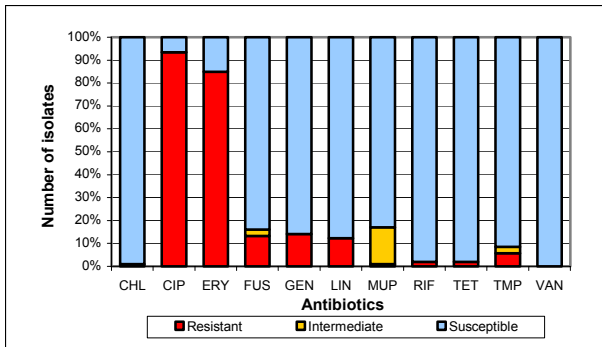


Figure 4. Antibigram results for MRSA isolates (n=106) referred to NMRSARL in Q4 2002.

Antibiotic codes: CHL, chloramphenicol; LIN, lincomycin. See legend for Figure 1 for explanation of other antibiotic codes.

In addition to the 101 EARSS isolates referred to the NMRSARL, in-house MICs were available for methicillin and vancomycin on one isolate and for oxacillin only on one other isolate.

The overall adherence to the protocol for oxacillin and vancomycin MICs (required for MRSA isolates only, n=115) was 89% (n=102). This represents a 6% increase from Q3 2002 (83% concordance).

S. aureus trends

The MRSA rate of 41.7% observed in Q4 2002 is slightly higher than the rate of 40.6% observed in Q3 (Figure 5).

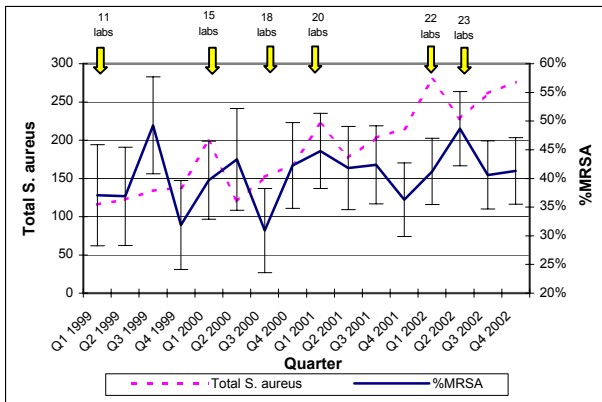


Figure 5. Trends for *S. aureus* by quarter – total numbers of *S. aureus* and percentage MRSA with 95% confidence intervals.

Streptococcus pneumoniae

Routine susceptibility test results are submitted on the first invasive isolate (blood or CSF) per patient per quarter. Susceptibility data are required for penicillin or oxacillin and erythromycin. Up to the end of June 2002, laboratories submitted all pneumococcal isolates to RCSI/Beaumont, where MIC testing for penicillin, cefotaxime and ciprofloxacin was performed. Laboratories are now asked to report on in-house Etest results for penicillin and cefotaxime, if available, on all penicillin-non-susceptible *S. pneumoniae* (PNSP) isolates.

Seventy-two *S. pneumoniae* isolates (71 from blood, one from CSF) were reported in Q4 2002. Isolates from ten patients (13.9%) with *S. pneumoniae* bacteraemia/meningitis were non-susceptible to penicillin. Susceptibility data to the most important anti-pneumococcal antibiotics are shown in Figure 6. Five laboratories reported zero episodes of *S. pneumoniae* bacteraemia during the quarter.

In comparison, there were 50 isolates in Q4 2001 yielding 14.0% PNSP. The PNSP rate for the year 2001 was 12.2%.

Penicillin non-susceptibility/resistance to other drugs

Of the ten PNSP isolates (all from blood) reported in this quarter, penicillin and cefotaxime/ceftriaxone Etest results were available for ten and five isolates, respectively. Nine isolates were determined to be intermediately-resistant to penicillin (MIC 0.12-1.0mg/L), of which two were also resistant to erythromycin. One isolate exhibited high-level resistance to penicillin (MIC ≥ 2.0 mg/L) and was additionally resistant to erythromycin and tetracycline. Six penicillin-susceptible isolates were erythromycin-resistant.

The overall adherence to the protocol for penicillin and cefotaxime/ceftriaxone MICs, which are required for PNSP isolates only (n=10), was 50%. This excludes ciprofloxacin MICs, which are also required by the protocol but are not routinely performed in laboratories.

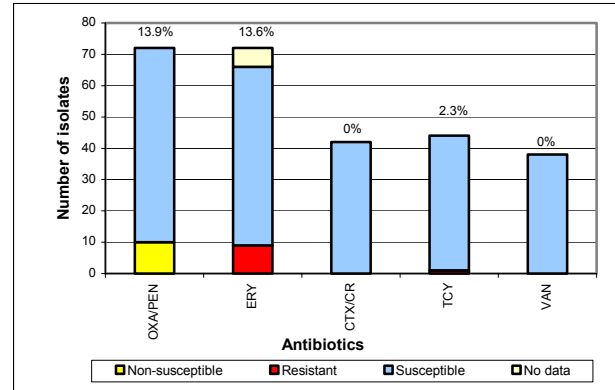


Figure 6. Susceptibility data for invasive isolates of *S. pneumoniae* reported in Q4 2002. Percentage resistance is indicated above the bar.

Antibiotic codes: OXA, oxacillin; PEN, penicillin; ERY, erythromycin; CTX, cefotaxime; CRO, ceftriaxone; TCY, tetracycline; VAN, vancomycin.

*EARSS includes both intermediate (low-level resistant) and resistant (high-level resistant) in the category non-susceptible.

Age and sex breakdown

Analysis of the pneumococcal data in Q4 shows that children aged 0-4 years and adults >60 years were most frequently infected by invasive *S. pneumoniae* (data not shown). The risk of infection for males was twice that of females.

S. pneumoniae trends

The penicillin-non-susceptible rate of 13.9% observed in Q4 2002 is slightly higher than the rate of 12.5% observed in Q3 (Figure 7).

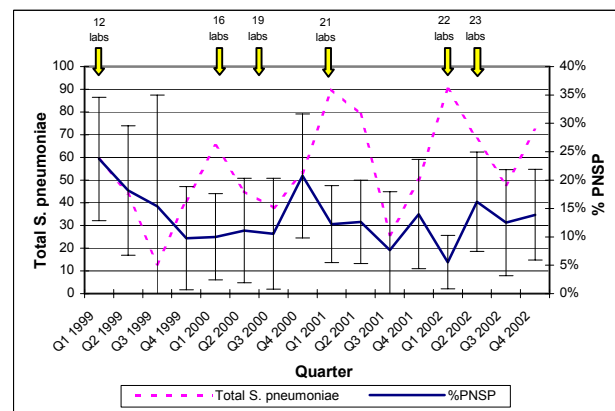


Figure 7. Trends for *S. pneumoniae* by quarter – total numbers of *S. pneumoniae* and percentage PNSP with 95% confidence intervals.

Escherichia coli

Routine susceptibility test results are submitted on the first invasive isolate (blood or CSF) per patient per quarter. Susceptibility data are required for a broad-spectrum penicillin (ampicillin), a third-generation cephalosporin (cefotaxime or ceftriaxone and/or ceftazidime), a fluoroquinolone (ciprofloxacin or ofloxacin) and an aminoglycoside (gentamicin). Testing for extended-spectrum beta-lactamase (ESBL) production is also required by the protocol.

In Q4 2002, data were submitted on 218 *E. coli* isolates (all from blood) from 20 of the 21 laboratories participating in the surveillance of this pathogen. Susceptibility data to mandatory and optional antibiotics are shown in Figures 8 and 9, respectively.

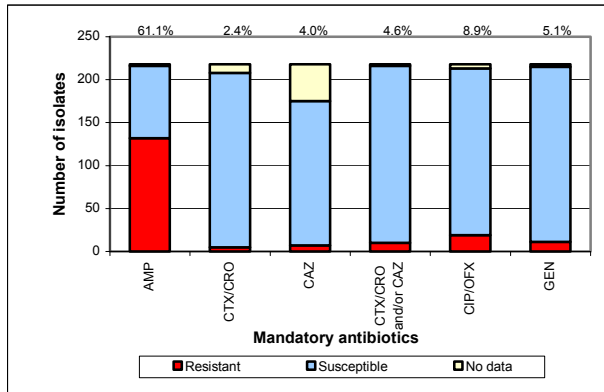


Figure 8. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. coli* reported in Q4 2002. Percentage resistance, excluding isolates with no data, is indicated above the bar.

Antibiotic codes: AMP, ampicillin; CTX, cefotaxime; CRO, ceftriaxone; CAZ, ceftazidime; CIP, ciprofloxacin; OFX, ofloxacin; GEN, gentamicin.

Ten isolates, from six different laboratories, exhibited multiple-resistance (defined as resistance to three or more of the antibiotic classes tested): four were resistant to ampicillin, third-generation cephalosporins (two of which were ESBL-positive), ciprofloxacin and gentamicin; five were resistant to ampicillin, ciprofloxacin and gentamicin; and one was resistant to ampicillin, third-generation cephalosporins and ciprofloxacin. Of the 81 isolates tested, two were found to be ESBL-producers.

Table 1. Number of isolates tested to the mandatory antibiotics, percentage resistance with 95% confidence intervals (CI) and concordance with the EARSS protocol among *E. coli* isolates in Q4 2002 (n=218). Data for Q3 2002 (n=190) provided for comparison.

	Q4 2002			Q3 2002		
	No.	%Resistance (95% CI)	EARSS Concord (%)	No.	%Resistance (95% CI)	EARSS Concord (%)
AMP	216	61.1 (54.6-67.6)	99	190	61.1 (54.1-68.0)	100
CTX/CRO	208	2.4 (0.3-4.5)		186	1.1 (0-2.6)	
CAZ	175	4.0 (1.1-6.9)		154	2.0 (0-4.1)	
CTX/CRO +/- CAZ	216	4.6 (1.8-7.4)	99	190	1.6 (0-3.6)	100
CIP	213	8.9 (5.1-12.8)	98	188	3.2 (0.7-5.7)	99
GEN	215	5.1 (2.2-8.1)	99	187	0.5 (0-1.6)	98

See legend for Figure 8 for explanation of antibiotic codes.

Overall, the concordance with the EARSS protocol (excluding ESBL detection) was 98% (see Table 1), similar to Q3. Data on ESBL detection were available on just 81 isolates from ten hospitals giving a concordance with the protocol of 37% (Q3, 41%). Seven laboratories reported ESBL data on all of their *E. coli* isolates.

There has been a marked increase in the resistance rates observed from Q3 to Q4: from 1.6% to 4.6% for third-generation cephalosporins, from 3.2% to 8.9% for ciprofloxacin and from 0.5 to 5.1% for gentamicin.

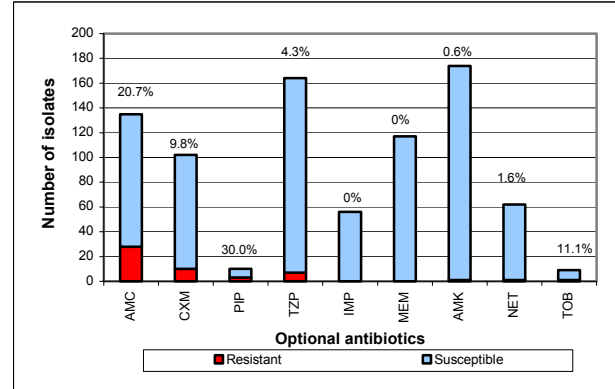


Figure 9. Susceptibility data to optional antibiotics for invasive isolates of *E. coli* reported in Q4 2002. Percentage resistance is indicated above the bar.

Antibiotic codes: AMC, amoxicillin/clavulanic acid; CXM, cefuroxime; PIP, piperacillin; TZP, piperacillin/tazobactam; IMP, imipenem; MEM, meropenem; AMK, amikacin; NET, netilmicin; TOB, tobramycin.

Enterococcus faecalis

Routine susceptibility test results are submitted on the first invasive isolate (blood only) per patient per quarter. Susceptibility data are required for ampicillin, gentamicin (low and/or high potency discs) and vancomycin.

In Q4 2002, data were submitted on 49 *E. faecalis* isolates from 11 of the 21 hospitals participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 10.

Ten isolates with high-level gentamicin resistance were reported from five laboratories in Q4 2002. There were no reports of vancomycin-resistant enterococci (VRE) isolates in this quarter. Three isolates were ampicillin-resistant.

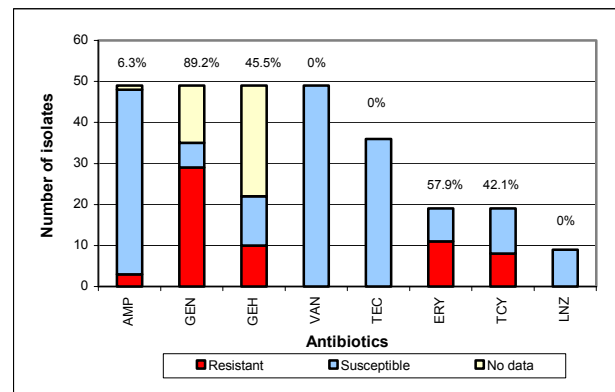


Figure 10. Susceptibility data for invasive isolates of *E. faecalis* reported in Q4 2002. Percentage resistance, excluding isolates with no data, is indicated above the bar.

Antibiotic codes: AMP, ampicillin; GEN, gentamicin (low potency disc); GEH, gentamicin (high potency disc); VAN, vancomycin; TEC, teicoplanin; ERY, erythromycin; TCY, tetracycline; LNZ, linezolid.

Overall, the concordance with the EARSS protocol was low at 84% (see Table 2), due to gentamicin not being tested routinely in many laboratories (and as low as 45% if only high-level gentamicin is considered).

Table 2. Number of isolates tested to the mandatory antibiotics, percentage resistance with 95% confidence intervals (CI) and concordance with the EARSS protocol among *E. faecalis* isolates in Q4 2002 (n=49). Data for Q3 2002 (n=41) provided for comparison.

	Q4 2002			Q3 2002		
	No.	%Resistance (95% CI)	EARSS Concord (%)	No.	%Resistance (95% CI)	EARSS Concord (%)
AMP	48	6.3 (-0.6-13.1)	98	40	5.0 (0-11.8)	98
GEN	35			27	59.3 (40.7-77.8)	
GEH	22	45.5 (24.7-66.3)	45	9	33.3 (2.5-64.1)	22
GEN/ GEH	41		84	31		76
VAN	49	0	100	41	7.3 (0-15.3)	100

See legend for Figure 10 for explanation of antibiotic codes.

Enterococcus faecium

Routine susceptibility test results are submitted on the first invasive isolate (blood only) per patient per quarter. Susceptibility data are required for ampicillin, gentamicin (low and/or high potency disc) and vancomycin.

In Q4 2002, data were submitted on 27 *E. faecium* isolates from 10 of the 21 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 11.

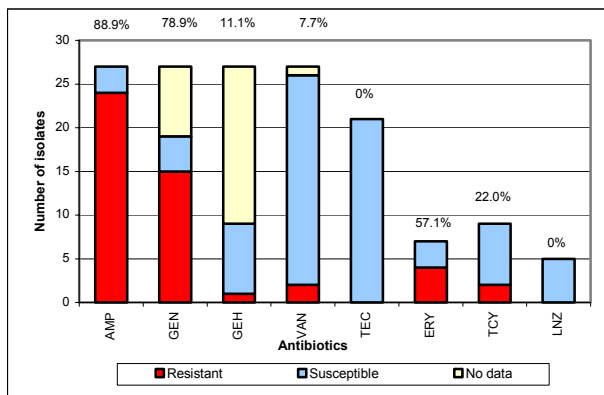


Figure 11. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. faecium* reported in Q4 2002. Percentage resistance, excluding isolates with no data, is indicated above the bar. See legend for Figure 10 for explanation of antibiotic codes.

Table 3. Number of isolates tested to the mandatory antibiotics, percentage resistance with 95% confidence intervals (CI) and concordance with the EARSS protocol among *E. faecium* isolates in Q4 2002 (n=27). Data for Q3 2002 (n=19) provided for comparison.

	Q4 2002			Q3 2002		
	No.	%Resistance (95% CI)	EARSS Concord (%)	No.	%Resistance (95% CI)	EARSS Concord (%)
AMP	27	88.9 (77-100.7)	100	17	100	90
GEN	19			15	86.7 (69.5-100)	
GEH	9	11.1 (-9.4-31.6)	33	8	25.0 (0-55.0)	44
GEN/ GEH	21		78	15		79
VAN	26	7.7 (5.2-17.9)	96	16	6.3 (0-18.1)	84

See legend for Figure 10 for explanation of antibiotic codes.

Two isolates from one laboratory were resistant to ampicillin, high-level gentamicin and vancomycin (teicoplanin not tested). One isolate from another laboratory was resistant to ampicillin and vancomycin, but susceptible to high-level gentamicin and teicoplanin. Overall, the VRE rate for Q4 was 7.7%. Additionally, three isolates were ampicillin-susceptible.

Overall, the concordance with the EARSS protocol was low at 78% (see Table 3), due to gentamicin not being tested routinely in many laboratories (and as low as 33% if only high-level gentamicin is considered).

EARSS News

Retirement of Prof Conor Keane

We wish Prof Conor Keane a very happy retirement and thank him for his much valued contributions to EARSS since the surveillance system commenced in Ireland in 1999.

Penicillin MIC determination using Etests and BSAC guidelines

BSAC have made a change to their guidelines with regard to the use of Etests for penicillin MIC determination of *Streptococcus pneumoniae*. They found that "cell lysis occurs on Isosensitest agar (ISA) plus blood and growth disappears into the agar resulting in less distinct end-points and slightly lower MICs compared with results obtained by conventional MIC methods. Colonies remain intact and are better visualised on Mueller-Hinton agar (MHA)." Thus, for laboratories that are still following either modified Stoke's or BSAC guidelines for susceptibility testing and using ISA plus blood, MHA should replace ISA when performing MICs by Etest. This does not present a problem for those laboratories that have already moved over to NCCLS.

EARSS expansion

We would like to welcome three new laboratories that have recently joined the EARSS project: Mayo General Hospital in Castlebar, The Coombe Women's Hospital in Dublin and Our Lady of Lourdes Hospital in Drogheda. All microbiology laboratories performing routine blood culture and CSF analysis are invited to participate in the EARSS surveillance system.

Referral of isolates to Reference/Referral Laboratories

Laboratories are asked to submit all MRSA isolates to the National MRSA Reference Laboratory as soon as possible following isolation. This is because isolates can lose resistance determinants, such as *mecA*, which will affect the overall typing results.

If you have any *E. coli* or other isolates with suspected ESBLs and/or with resistance to multiple antibiotics that you would like confirmed or epidemiologically typed, Prof Martin Cormican at the Dept. of Bacteriology, NUI Galway is happy to receive them for analysis and storage. For convenience, such isolates can be sent along with any salmonella isolates being referred to the Interim Salmonella Reference Laboratory.

Prepared by Stephen Murchan and the EARSS Steering Committee (Prof Martin Cormican, Dr Robert Cunney, Dr Lynda Fenelon, Prof Hilary Humphreys, Prof Conor Keane, Dr Olive Murphy, Dr Darina O Flanagan and Dr Angela Rossney).

Participating Laboratories: Adelaide, Meath and National Children's Hospital, Tallaght; Beaumont Hospital, Dublin; Bon Secours Hospital, Cork; Bon Secours Hospital, Glasnevin; Cavan General Hospital; Cherry Orchard Hospital, Dublin; Cork University Hospital; James Connolly Memorial Hospital, Blanchardstown; Letterkenny General Hospital; Mater Misericordiae Hospital, Dublin; Mercy Hospital, Cork; Midland Regional Hospital, Mullingar; Mid-Western Regional Hospital, Limerick; Our Lady's Hospital for Sick Children, Crumlin; Rotunda Hospital, Dublin; Sligo General Hospital; St Columcille's Hospital, Loughlinstown; St James's Hospital, Dublin; St Vincent's Hospital, Dublin; Tralee General Hospital; Temple St Hospital, Dublin; University College Hospital, Galway; Waterford Regional Hospital.